

SELECTIONS
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N^o. VII.
REPORT
ON
THE ELECTRIC TELEGRAPH
BETWEEN CALCUTTA AND KEDGEREE.

By
W. B. O'SHAUGHNESSY, ESQ., M. D.
SUPERINTENDENT OF THE ELECTRIC TELEGRAPH.

Calcutta:
F. CARBERY, MILITARY ORPHAN PRESS.
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SUPERINTENDENT OF THE ELECTRIC TELEGRAPH,

From Dr. W. B. O'SHAUGHNESSY,
Superintendent Electric Telegraph,
To J. P. GRANT, Esq.,
Secretary to the Government of Bengal.

SIR,

In presenting the accompanying Report on the present state of the Electric Telegraph lines, I have much pleasure in stating that the conductor has been laid across the Hooghly river, defended by a massive chain cable. The operations were completed on the 29th instant, and intelligence was conveyed through the line yesterday, the 30th, when a message to Kedgeree regarding a steamer was despatched from Calcutta, and the answer received in *seven minutes*. Strong signals are conveyed across the river with a miniature battery of *four* small pieces of platinum wire.

Referring to the accompanying Report for details regarding the construction of this river conductor, its liability to fracture by ships' anchors, and the measures recommended in the event of its maintenance being found to be impracticable, I have only to add that the working of our present lines across the Huldee and Hooghly rivers, demon-

strates that it is from ships' anchors only that the least difficulty is to be apprehended.

The rivers which intervene between Calcutta and the North-Western Provinces, will offer no impediment to Telegraphic correspondence, whenever the line may be extended in that direction.

I have the honor to be,

Sir,

Your most obedient Servant,

W. B. O'SHAUGHNESSY,

Supdt. Electric Telegraph.

CALCUTTA,
Electric Telegraph Office, }
The 31st of March, 1852. }

P. S.—I wish to add that before opening the whole line for regular work, it is necessary to have it carefully examined by the Inspector, which will occupy him for some days.—W. B. O'S.

FROM

-DR. W. B. O'SHAUGHNESSY,
Superintendent of the Electric Telegraph,

To

J. P. GRANT, Esq.,
Secretary to the Government of Bengal.

SIR,

In obedience to the wishes of the Most Noble the Governor of Bengal, I have the honor to submit the following report, showing the present state of the lines of Electric Telegraph now constructed and in operation, the working and results of the system of correspondence in use since the offices have been opened for actual business, the expenses incurred in all branches of the undertaking, and the bearings of our present experience and information on the construction of lines to the North-Western Provinces, Bombay and Madras.

2. The lines now in actual use for public business, are :—

1st. Calcutta to Diamond Harbour, <i>Direction North and South.</i>	30 Miles
2nd. Bishtopore to Moyapore, meeting No. 1 half way, <i>Direction East and West.</i>	11 Miles
3rd. Kookroohattee to Kedgeree, including the Huldee river 4,200 feet broad,	25 Miles
	—
	66
	—

The lines ready for use* when the crossing of the River Hooghly has been permanently effected, are :—

4th. Diamond Harbour to Kholakhali,	$3\frac{3}{4}$ Miles
5th. Buffaloe Point to Kookroohattee,	1 "
6th. Tarapooka extension line on Kedgeree side,	10 "
7th. Hooghly River,	$1\frac{1}{4}$ "
	—
	16 Miles,
	—
Total lines,	82 Miles,

DESCRIPTION OF LINES.—3. The Calcutta and Diamond Harbour lines run from Chandpal Ghaut, Calcutta, to the Post Office and Semaphore Building at Diamond Harbour.

UNDERGROUND.—4. There is one conductor of $\frac{3}{8}$ inch iron, laid underground in a cement of melted rosin and sand (in the manner minutely described in a former report)* from Chandpal Ghaut, by the Course, across the Meidan, over Alipore Bridge, through the populous bazars and suburbs of Alipore, Bursia and Beyla, through the Mission station of Thakoorpookur, to Rajmolla Chucka village, on the causeway, where the overground system commences. The iron rod is thence

OVERGROUND. extended through Kurreebarra, Bistopore, Rajhat and

Sursya to Diamond Harbour, on bamboo poles, 15 feet high, coated with coal-tar and pitch, and strengthened at variable distances by posts of saul-wood, teak, and iron-wood from Arracan, all under observation with reference to the comparative effects of the weather, wet earth, insects, &c., on the several kinds of timber employed. To these posts the iron rod is screwed by powerful iron clamps.

MOYAPORE LINE.—5. At Bishtopore, half way, this line is divided at a central Bungalow, where the Moyapore branch meets that from Calcutta at a right angle. The line to Moyapore is constructed over-

ground in the same manner as that just described, but there being no road, it runs on the footpaths in use between the *island* villages, and crosses for some miles through rice swamps, jeels, and creeks, on which no road or embankment or bridge exists. Much of this line was constructed during the rains, the welding of the iron rods having been done in canoes.

LED ACROSS SWAMPS AND RICE FIELDS.
6. The country between the two stations is, in fact, a lake from June to December. I purposely selected this troublesome and objectionable line, on the principle by which I have all through this undertaking been guided, that of encountering the greatest difficulties first, so as to know the worst at once. Expense and labour thus incurred, lead clearly to economy and facility in the construction of other and more important lines.

* See Appendix C.

† Moyapore a corresponding station on the river side, a frequented anchorage, Powder Magazine, &c. and close to the place where the Bombay Mails cross the river.

7. The lines of conductor from Diamond Harbour to Kalakhali,
 DIAMOND HAR-
 BOUR TO KEDGE-
 REE.

Buffaloe Point to Kookroohattee, Kookroohattee to
 Kedgeree, and the extension by Tarapooka Ghat are
 all overground, on bamboos, with 8 to 10 substantial
 saul, teak or iron-wood posts to the mile, these provided with strong
 binding screws. These lines are all erected on the pathways provided

CROSSES HULDEE
 RIVER AT KEDGE-
 REE SIDE.

for the dawk runners, or on the banks of the rivers.
 The Huldee river crosses the Kedgeree line half way,
 varying in breadth from 4,200 to 5,800 feet, according

to the season. A gutta percha covered wire, secured in the angles of a chain cable, is laid across and under this river. The chain cable is found to afford perfect protection against the grapnels of the heavy native boats which incessantly pass up and down, and which, owing to the violence of the currents and the danger of quicksands, are compelled to drag their anchors when they move at particular times of the tide.

NO WIRE USED ON OUR LINES.—8. The overground lines, above specified, differ totally from those in use in England, America or any other country, in the following most important point—no WIRE is used. Instead of wire, I employ a thick iron rod $\frac{1}{2}$ inch diameter, weighing one ton to the mile (the heaviest wire used elsewhere, is 1 cwt. to the mile.) The use of these iron rods presents the following real advantages over wire:—

1st. ADVANTAGES IN USING THICK IRON RODS.—Immunity from damage or fracture by gusts of wind or ordinary mechanical violence. In the hurricane of the 23rd and 24th October last year, not one of these

SHOWN BY
 HURRICANE OF
 23RD AND 24TH
 OCTOBER LAST.

rods was broken, while in my own experimental line of wire, constructed in 1839, every north-wester broke many of the wires.

2d. If accidentally thrown down by the sliding of an embankment or any other cause, these rods are not injured, although passengers, bullocks, buffaloes and elephants trample on them as they pass.

3d. They cannot be broken or bent without giving great trouble and requiring the use of smith's tools, so that mere idlers do not meddle with them.

4th. By their mass of metal, they give so free a passage to our electric currents, that no insulation is required. We attach the rods to our bamboos, posts, &c., without employing glass, porcelain, or any

other non-conductor ; yet, through these lines, we work without interruption during tropical deluges of rain, with miniature batteries, consisting of a dozen cells of platinum *wires* and zinc. This non-necessity for electric insulation further gives us great protection against lightning. The moment rain falls we are almost safe, as the lightning which strikes the line escapes by the *wet posts* to the ground.

5th. NO TENSION REQUIRED IN OUR LINES.—Again, our system differs from that adopted elsewhere, by the rods being placed on the supports without occasion for the straining and winding apparatus which must be employed with wires. This tension renders wire incessantly liable to fracture, and occasions much expense in construction, and much difficulty in repairs. Avoiding this strain enables us to use bamboos as our principal supports, which have special advantages subsequently pointed out.

6th. These thick rods admit of *rusting* to take place to an extent which would be fatal to a wire line, unless coated with zinc, a process which weakens the wire and adds much to its cost.

7th. RODS NOT MORE COSTLY THAN THIN WIRES.—In point of expense there is no objection to the use of rods. If imported direct, they would not cost more than £10, say 100 rupees per mile. The cost of welding is $\frac{1}{3}$ thi more ; that of carriage or transmit ~~is~~, doubtless, greater than for the lighter wire ; but all this included falls far below what would be expended on the winders, insulators, zincking, and straining posts absolutely necessary on a wire line.

WELDING OF RODS NO DIFFICULTY.—9. That the welding of the lines of iron rods presents no practical difficulty is shown by our experience. We have, on several occasions, with one village forge, carried by two coolies, welded up a mile of rods in a working day. The rods are previously prepared in 200 feet lengths at a central dépôt.

10. I have enumerated these facts in detail, because I attach great importance to the iron rod system, as different from that of *wires*, and most especially with reference to its value in India. If we have to construct lines for general communication, our track will often run through a “howling wilderness,” tenanted only by wild beasts, or mere savages in human form, while on our best roads, even if we entertain a Police establishment, we may rest assured they will take but slight trouble in their duties. The lines must protect themselves, or incessant interruptions will take place.

RODS NOT INJURED BY BIRDS OR MONKEYS.—11. I pass over, with slight remark, the damage done to *wires* in my experiments in 1839, by birds and monkeys. Whole swarms of crows, kites and fishing eagles may now be seen daily, enjoying themselves on our lines through the swamps of the Diamond Harbour road. They cause us no harm, and we do not molest them. Our correspondence flies through their claws without interception, but it has happened, on one occasion, that a flash of lightning struck the *wet* rod, and killed some scores of its harmless incumbents.

USE OF BAMBOOS.—12. The use of the bamboo for supporting posts demands especial notice. At first I only tried it as a scaffolding, to be replaced by teak or saul posts; I did not suppose it possessed of sufficient strength or durability to be permanently employed. But the hurricane of the 23rd and 24th October exposed our lines to an

BAMBOOS RESIST
STORMS WHICH
DESTROY TIMBER
POSTS.

ordeal I never expected they could go through unharmed. While trees, the growth of centuries, were uprooted, houses of solid masonry levelled with the ground, the country inundated, the *Precursor* and *Powerful* Steamers driven ashore, a fleet of ships and innumerable native craft wrecked or dismasted—not one of our posts was broken. It was the realization of the fable of the Bulrush and the Oak. The bamboo bent slightly to the hurricane, and rose erect when its violence had ceased.

13. In point of *durability* the bamboo may be open to objection. But this must be viewed with reference to prime cost, abundance and facility of supply, and degree of labour in construction, whatever timber be employed. Now 100 bamboos cost, carriage included, say, 16

CHEAPNESS OF
BAMBOOS.

Rupees, 100 saul posts of equal length 300 Rupees. The saul posts must be renewed in 8 years, as shown by the present state and history of the palisades of Fort William.

14. Thus the comparative cost in 8 years would be, as shown in the

margin, 472 Rupees per mile in favor of the bamboo. It should be added that the lightness of this kind of post, the abundance and ubiquity of its supply, the ease

Bamboos, 200 per mile,	Rs.	32
Renewed say in every 2 years in 8 years,	"	128
Cost of Saul Posts 200 at 3 Rupees,	"	600
Difference in favor of Bamboos in one mile,	"	472

with which it is worked, and the rapidity with which it is placed, are all

practical advantages of such real value, that I am persuaded that were bamboos available in Europe, no other supports would be employed.

15. While the overground system, on the plan I have followed, presents the great advantages of rapidity in construction, exceeding cheapness and immunity from accident from storms, lightning and wanton

OBJECTIONS TO
EUROPEAN OVER-
GROUND SYSTEM
STILL MAINTAINED.

injury, to a degree I could scarcely have anticipated, I am bound to say that the objections I recorded in 1850, in my Report to Government, to the European and American overground system, as advocated by Colonel Forbes, remain totally unaffected by the results now attained and described. But were this otherwise, had it been that my former views were erroneous, it seemed to me that the moment I was entrusted with the construction of an *experimental* line, it became my paramount duty to dismiss every pre-conceived or controversial opinion, and apply myself to ascertain the method which would afford the cheapest, safest and quickest means for accomplishing the all-important object of Telegraphic communication, totally leaving aside how far the results might establish or refute my previous opinions.

SUBTERRANEAN SYSTEM INDISPENSABLE IN CERTAIN LOCALITIES.—16. But notwithstanding the advantages thus set forth, there are many localities where the subterranean or subaqueous plan is indispensable; for instance, through all populous towns and markets, across rivers too broad to be spanned from masts, and in the immediate vicinity of each corresponding station, where the subterranean position of a portion of the line constitutes the best of all protections from the appalling dangers of the thunder-storms, so incessant and terrific for several months of the

AND AFFORDS
GREAT PROTEC-
TION FROM
LIGHTNING.

year in this country. The experience of the month now ending has afforded such evidence as places this fact in the clearest light.

UNUSUAL FREQUENCY AND SEVERITY OF THUNDER-STORMS THIS MONTH.—17. Thunder-storms have been more frequent and more violent from the 1st to 26th of March this year, than has been the case in any three months for the last fifteen years. During these storms, flashes of lightning have repeatedly entered our offices, but no injury has been caused to any individual, and but one instrument has been rendered unserviceable.

18. In thus describing, however, the immunity we have enjoyed, I, by no means wish to assert that all risk has been obviated. The occupation of a signaller has its perils, so has that of the soldier and sailor—

all we can do is to use every precaution, which science and experience teach us to adopt.

RIVER CROSSING.—19. In para. 7, I have described the method by which the Huldee river, 4,200 feet wide, has been successfully crossed, and which is now in course of application to the Hooghly river, 6,200 feet wide, above Diamond Harbour.

20. I have already, in several previous Reports, referred to a great number of experiments made by my assistants and myself on this very important point. Without entering into details too fatiguing for a general reader, I have to state the following facts:—

WITH A REPEATING INSTRUMENT AND NAKED ROD.—21. The system alluded to, in my report to the Military Board, dated 20th December 1849, consisting in the use of a repeating instrument on each bank of the river, and a naked massive Rod across and below the water, was tried with success; but it was found that the repeating instruments required to be attended by skilful and careful assistants, and that, in

FAILED. practice, such derangement occurred as caused very frequent interruptions. This plan was accordingly set aside.

WITHOUT METALLIC CONDUCTORS.—22. Again a method of conveying signals across a broad river, without any metallic conductor, using the water itself as the sole vehicle of the Electric impulses, was tried at great labour, and at considerable expense, and signals were so conveyed across the Hooghly river in the month of May last, for several days, at the line where the chain is now being placed. But it was ascertained

NOT APPLICABLE IN PRACTICE. that to correspond by this system required an enormous battery, of at least 300 cells, and that the maintenance and working and current expense of this battery would cause such heavy outlay, and call for the application of such labour and skill, as could not be in practice devoted to any river crossing. The system was accordingly given up, after full and fair trial.

DIFFERENT KINDS OF CONDUCTORS TRIED.—23. Innumerable experiments were subsequently made on iron and copper wire ropes, insulated in different modes, protected by spiral and parallel coatings of iron wire and rods. In these experiments so many failures occurred, that it needed some perseverance to arrive at a successful issue. This has been, I conceive, attained, and I shall describe, with all possible brevity, the system I should now follow in future lines.

CHAIN CABLE SYSTEM FINALLY ADOPTED.—24. A copper wire covered with gutta percha (in England) forms the Electric conductor. The wire is but $\frac{1}{16}$ th inch in diameter, so slight that it may be broken by the fingers ; the gutta percha coating is so soft that it can be cut through with the nail, and moreover, it is liable to be (very slowly) acted upon by water. To use this wire, so as to depend on our correspondence being maintained, we must protect the wire itself from all mechanical strains, and its coating from similar injury, and from the chemical agency of the water in which it has to be placed. This latter object I accomplished, by covering the gutta percha with a spiral coating of sheet lead, secured closely and firmly by a spiral of tape, saturated with melted wax applied hot. Experiments now conducted for 16 months show that, *in that time*, the gutta percha coating of a wire, so prepared, experiences no change of weight, and undergoes no chemical action of any appreciable amount.

25 For the mechanical protection of that line, I adopt two systems, according to the nature of the river to be crossed, whether tidal and navigable by large vessels, or such as we have to deal with chiefly towards the N. W. nearly dry for a part of the year, and for the remainder only navigated by small craft, using light anchoring tackle.

EXPERIMENTS ON THE HULDEE RIVER.—26. The *Huldee* river is an instance of the first kind. Across that river I have laid successively five experimental lines ;—1, a copper wire rope, insulated with wax and tape ; 2, an iron wire rope ; 3, a gutta percha coated wire undefended ; 4, a gutta percha covered wire with defensive coating like that used between Dover and Calais ; 5, and lastly, a gutta percha covered wire, secured in the angles of a chain cable. Of these the

FOUR LINES
CUT THROUGH
BY NATIVE
BOATS.

1st, 2nd, 3rd and 4th, were cut through by the grapnels of Native craft, in periods varying from one to twenty days.

The last mode has proved successful. The chain tears away the grapnels which hook it, and the boatmen now give the line a “wide berth.”

27. It is almost unnecessary to say that the failure of the four first trials, made chiefly to ascertain how far a guard-boat could be depended upon for the defence of lines not mechanically or self-protected, caused considerable outlay, and gave me much anxiety, but the result now obtained is, I conceive, well worth the previous cost. For all tidal

rivers like the Huldee, navigated by Native craft under 100 tons burthen, I conceive the chain system to be completely efficient.

28. How far the plan is applicable to a great river like the Hooghly, navigated by fleets of shipping of all tonnage to 1,600 tons and more, and by heavy Native craft not under European Officers—especially in the only locality where there is a chance of maintaining the line intact, remains to be decided by actual trial. That trial is now in progress.

CROSSING THE HOOGHLY RIVER.—29. A chain of $\frac{7}{8}$ inch iron cable is being laid across, under the able management of Mr. Wickham, the Assistant Harbour Master, by whom the chain was placed across the Huldee. The bed of the river being soft mud, the chain will doubtless sink in many places, so as to be below the reach of anchors when dragged across the line, but in some places it may not settle to this depth, and emergencies will arise, in which ships must drag their anchors, and endanger the continuity of the chain.

PRECAUTIONS USED.—30. To guard against this as far as practicable, a boat under a European Officer is stationed on the line; signal guns are fired from Kookroohattee when vessels approach it; Beacons have been erected at each side of the river; notices have been issued by the Marine Authorities to the Pilot Service, and circulated in Bengali among the native navigators. A semaphore mast is also being erected to carry on the communication with Diamond Harbour, in case of casualty to the chain. Despite of all these precautions, this river crossing must always be a source of anxiety, and involve a risk of interruption.

A LINE TO SAUGOR RECOMMENDED INSTEAD OF KEDGEREE LINE.—31. I now very much regret that the Marine Authorities, when duly consulted prior to our selection of a line to the sea, objected to the route *via* Kulpee and Saugor to the site of the New Light-House, which I then wished to follow, and which I believe they would now admit to have very great advantages over the Kedgeree line. It is satisfactory, however, to know that should the chain fail us, as I believe

ALL MATERIALS
OF KEDGEREE
LINE AVAILABLE
FOR ONE TO SAU-
GOR.

it will, the whole of the Telegraph rods, supports, &c., can be transferred in a few days to the Diamond Harbour side, and may in a month or six weeks be erected so as to afford a corresponding station at Culpee and another at Saugor Light-House. Culpee is a much frequented anchorage, within sight of Rungafulla tidal semaphore, in correspondence with which it would transmit reports of great practical value on the

depth of water in the critical channels between that station and Kedgerree. An office at Saugor Point would give intelligence of arrivals, often two days earlier than Kedgerree; would report vessels in distress; would

convey orders to outward-bound Steamers and Shipping;

GREAT ADVANTAGES OF A SAUGOR LINE. and would communicate news and despatches of importance, with very much greater facility and certainty than can be accomplished *via* Kedgerree, where inward-bound Vessels in the S. W. Monsoon seldom anchor, and /scarcely communicate even their names before their arrival at Diamond Harbour.

32. All these advantages would be gained at a reduction of our present Establishment of the guard boats and officers

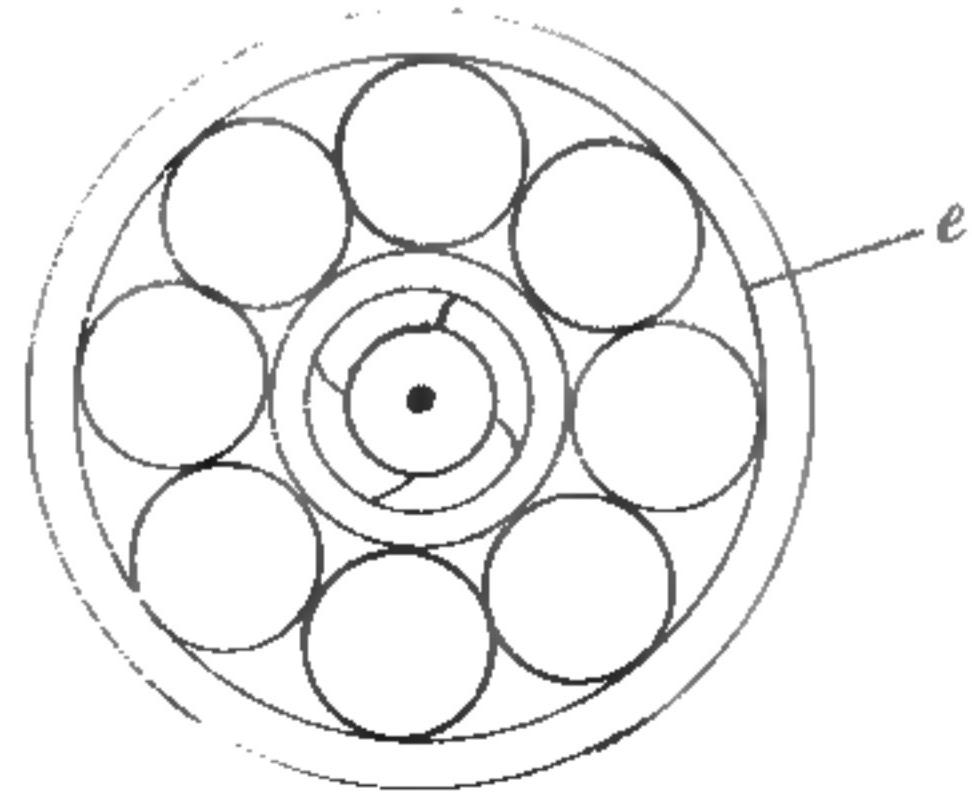
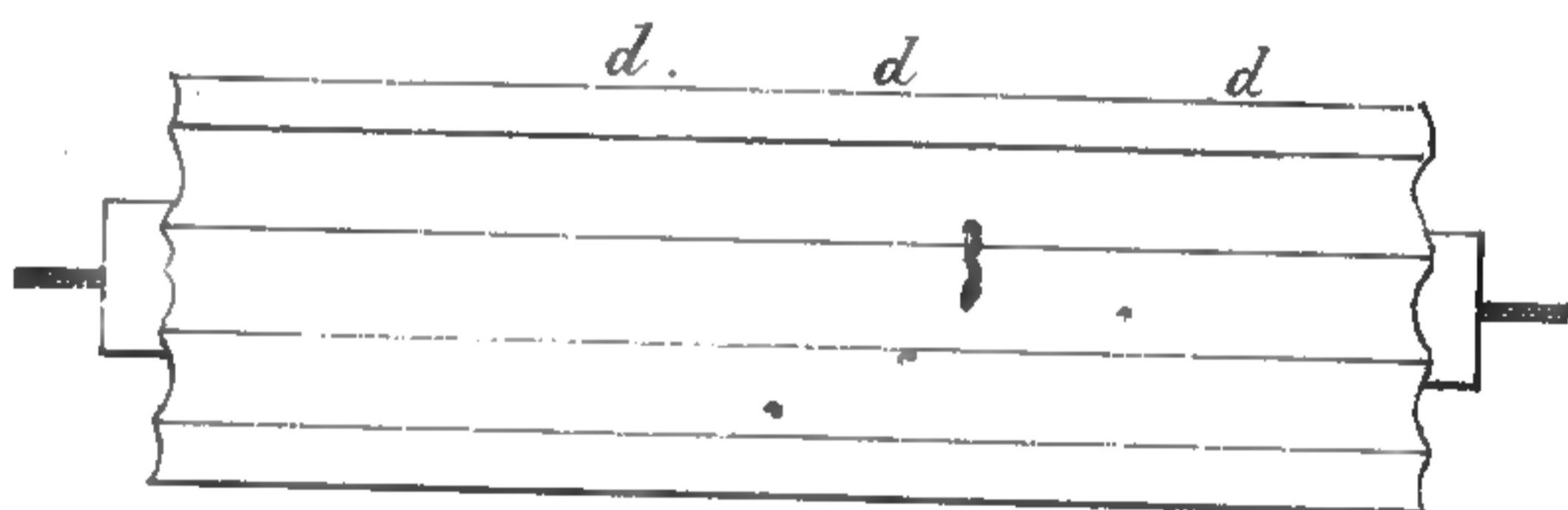
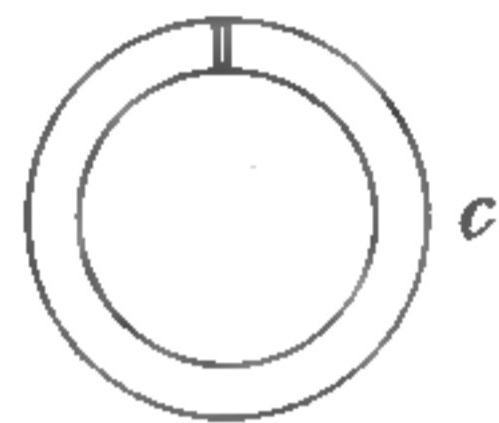
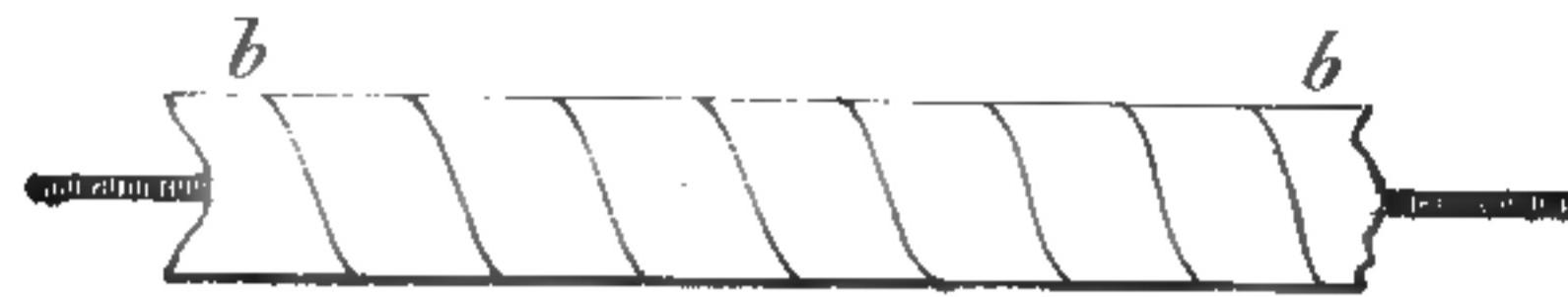
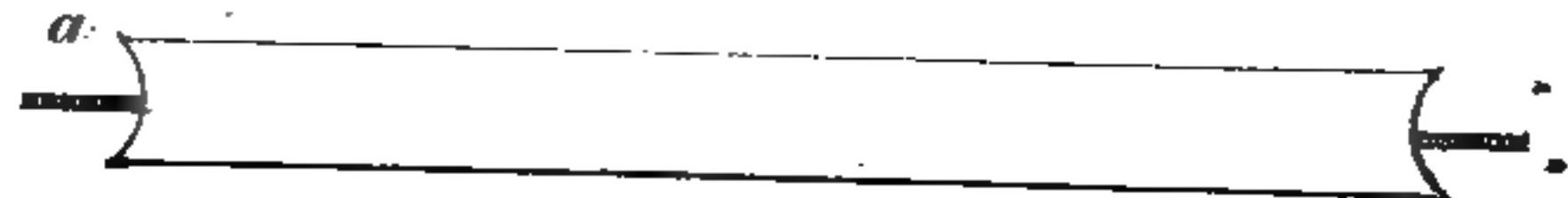
WOULD BE OBTAINED AT A SAVING OF 200 RS. A MONTH. now entertained for the Hooghly and Huldee River lines, amounting to about 200 Rupees per month.

33. In the opinion of the best judges, persons familiar with the river and with Saugor, there is no practical difficulty whatever in running the line along the edge of the island. Channel Creek is the only wide water crossing. This is nearly dry at ebb tide and is never kedged through. There are several small creeks, but they present no impediment worth dwelling on; as they, as well as Channel Creek, can be crossed with certainty and ease in the mode I shall now describe.

34. The gutta percha covered wire *a. a.* coated with sheet lead and waxed tape *b. b.* is surrounded transversely with rings cut out of iron wire, as shown in the accompanying sketch *c.* Parallel to the wire outside the rings are then placed iron rods, each $\frac{3}{8}$ inch diameter, touching each other so as to form a bundle like the Roman fasces, *d. d. d.* The length of these rods is rather greater than that of the river or creek to be crossed. The rods are then secured by transverse loops of iron, *e.*

35. An experimental line of this kind has been tested at the Alipore Iron Bridge yard, by every sort of mechanical trial far more severely than by any impact or strain to which it possibly can be subjected in the rivers or creeks referred to, and has most successfully withstood all attempts to injure it. It is as flexible as a *wire rope* of the same diameter.

36. This is the plan I would accordingly follow in Channel Creek, or in the rivers between Calcutta and the North-West, such as the Soane, the Ganges, Jumna &c., across which it can be placed with ease



*Section
of d.d.*



and certainty. In point of expenc it may be estimated at about 3,000 rupees for the mile of river.

37. The working of a line to Saugor *via* Culpee, might be depended upon the whole year through, as certainly ■ that of the line between Diamond Harbour and Calcutta is at present. Communication with Kedgeree might be maintained if thought desirable by Semaphore, but the lumbering inefficiency of the Semaphore system, gives it but a questionable shade of superiority over the dawk itself. I should not

conclude the notice of this subject without alluding to

ADVANTAGE OF
SAUGOR LINE IN
CASE OF WAR. the great value the communication with Saugor would prove of in time of war, in the early receipt of intelligence and orders, and in the possible case of the approach of an enemy's cruizers to the mouth of the river.

38. I now proceed to consider the working and results of the system of correspondence in use since the offices have been opened for actual business.

SYSTEM OF CORRESPONDENCE ON THE LINES.—39. This took place on the 4th of October, when the junction was completed between the experimental station at Alipore and the new office at Chandpal Ghat, Calcutta. Since that day four offices have been regularly in correspondence, namely Calcutta, Moyapore and Diamond Harbour, with ■ reserve station at Bishtopore ; and since the 3rd February two offices, Kedgeree and Kookroohattee, have been open on the Kedgeree line.

INTELLIGENCE PUBLISHED FOUR TIMES DAILY.—40. From the 4th of October till the 5th of December, the line was worked, and shipping intelligence was printed and circulated gratuitously, with the view of satisfying the mercantile community as to the efficiency of the correspondence which could be carried on by its means. This done, the Semaphores between Calcutta and Diamond Harbour were abolished on the 5th of December.

NO INTERRUPTIONS ON OUR LINES.—41. From that day till this date, I am happy to say, no interruption whatever has taken place in our correspondence; a result the more important, as such interruptions are of very frequent occurrence, and of long duration, on the European lines, where the weather is often blamed for what I believe to be the fault of the instruments and persons employed in the offices.

NIGHT CORRESPONDENCE.—42. Night correspondence has, in a great number of urgent cases, been carried on, with a certainty and rapidity which I did not myself anticipate. The signal boys sleep in the in-

strument rooms, where an alarm is set. When thoroughly awakened, (not an instantaneous operation with a sleepy school boy) correspondence proceeds as if by day. As an instance of what has been done in this way, I may adduce a visit by the Superintendent of Marine, Captain Rogers, to the Calcutta office, about eleven P. M., on the night

of 14th February, to learn if the *Phlegethon S. V.* had

KING OF AVA'S LETTER. landed the King of Ava's letter at Diamond Harbour.

In four minutes the answer was obtained from that station, although all the signallers were in bed and asleep when Captain Rogers came to the office.

43. The degree of confidence reposed in the office by the public is such as to surprize us all. Messages on banking business, law matters,

Opium speculations, domestic concerns, &c., many being of a strictly secret nature, have been entrusted to us, and in no case have I had reason to find fault with our employées for any indiscretion.

44. On one occasion two individuals were, on the same day, sending orders to their Agents at Kedgeree, one to arrest a Ship, the other to despatch it with all possible speed. Neither party could obtain any information as to the despatch sent by the other, although the attempt was made by both to penetrate the secret.

MONEY RECEIPTS.—45. Our pecuniary returns are three-fold greater

PRIVATE MESSAGES.

CASH RECEIPTS.			
December 1851.			
Private Messages sent and received, 116 13 0			
Subscriptions for Circulars, ... 429 10 6	546	7	6
January 1852.			
Private Messages sent and received, 257 12 0			
Subscriptions for Circulars, ... 474 9 3	732	5	3
February 1852.			
Private Messages sent and received, 148 4 0			
Subscriptions for Circulars, ... 488 0 0	636	4	0
Total Company's Rupees, ...	1915	0	9
Average of three months, } Rs. 638 5 7			

than I anticipated. I stated that 200 rupees a month might be expected. Over 600 rupees are now constantly realized; and that this amount will be much increased, when either the Kedgeree or Saugor line can be depended upon for continuous correspondence, I think cannot admit of reasonable doubt.

SERVICE MESSAGES.—46.

Besides the messages from private individuals, the telegraph is daily had recourse to for reports

and intelligence and orders to and from the Marine Department,

■ SERVICE MESSAGES.

PRO FORMA CHARGES.				
	December 1851.			
Service Messages sent and received,	185 15 ■			
Circulars at <i>pro forma</i> charge, 96 0 0				
	281 15 0			
	January 1852.			
Service Messages sent and received,	301 14 0			
Circulars at <i>pro forma</i> charge, 96 0 0				
	397 14 0			
	February 1852.			
Service Messages sent and received,	450 0 0			
Circulars at <i>pro forma</i> charge, 96 0 0				
	546 0 0			
Average per month, ... } Rs. 408 15	Total, Co.'s Rs.,	1226 13 0		

for Reports to the Superintendent of Salt Chowkies, and other public authorities, and the aggregate of such communications, charged *pro formd* at the same rate as private messages, shows that the work done by the office is ■ direct profit to Government, even in this incipient stage of our operations.

47. On the Kedgeree line two stations are maintained, Kookroohattee and Kedgeree, and whenever any despatch of importance

is transmitted from Kedgeree, ■ boat takes it from Kookroohattee to Diamond Harbour. The necessity of this will cease when the chain line is laid across, and it is then more than probable that the Kookroohattee station may be abolished.

ESTABLISHMENT OF SIGNALLERS REQUIRED.—48. The establishment entertained to work these lines, with six corresponding offices, required by the exigencies of ■ many river stations, is composed of the individuals named in the accompanying Appendix, (B,) at the salaries specified, in all amounting to Rs. 867-0-0.

Establishment for December 1851, ...	829 1 0			
Ditto for January 1852,	826 2 3			
Ditto for February 1852, ...	874 10 ■			
	2529 13 11			

part of the lads themselves. Were they to suppose we could not do without them, as would be the case had we barely the number required, it would need but slight temptation to induce them to desert us at

**NECESSITY FOR
NUMEROUS EXTRA
HANDS ON THESE
LINES.**

critical times, and to trouble us by importunate demands for increase of allowances. With a few extra hands I can admonish, fine, and punish at discretion, and provide for absence through sickness, thereby ensuring efficiency, while with a smaller number I could not venture on the system of discipline I now rigorously adopt, nor supply substitutes for those disabled by the fevers which prevail at all the out-stations.

RATE OF SIGNALLING.—50. The proficiency of the youths in correspondence daily improves. Up to this time I have prevented the use of abbreviations, and caused each word to be spelt in full, with reference to the youth and inexperience of some of our signallers, and the paramount importance of avoiding mistakes in correspondence. With our senior lads, the rate of signalling and reading now equals that on the English lines, and when I feel myself warranted in permitting the use of abbreviations, our work will equal that of the American offices.

FALLACIOUS STATEMENTS REGARDING RATES ON OTHER LINES.—51. I would here advert briefly to certain statements, which from time to time astonish the public, respecting the despatch of several hundred words in a minute, by means of telegraph machines and electric currents. The thing is possible in two rooms of the same house, or even on an extended line, when insulated by absolute dryness of the air, or by the whole of the lines being encased in ice, in the depth of an American winter. But the possibility exists only for the work of a few minutes, when these deceitful and complicated instruments are certain to become disordered. We may, I consider, deem ourselves fully efficient, if we work in India as well as they do on the great English lines; and this condition I may fairly say we have already attained. I therefore dismiss all considerations of the elaborate toys to which I allude, which, however creditable to the skill of the constructor, are practically but of insignificant value, and most certainly, for reasons to be adduced in another place, can never be made use of on Indian lines.

52. I now proceed to notice succinctly the instruments in use in all our stations.

INSTRUMENTS USED ON OUR LINES.—53. I had in 1839 ascertained by experiments on a very large scale, that to maintain Electric correspondence in India would require great modifications in the instruments used elsewhere, owing to the prodigious electric excitement of the atmos-

phere which is of such frequent occurrence, and to many other causes which I have detailed in previous Reports.

NECESSITY FOR USING THE SIMPLEST POSSIBLE INSTRUMENTS.—54. Accordingly, on organizing experimental correspondence for our lines, I speedily found that unless the instruments could be reduced to such a condition of simplicity, that when deranged they could be set right by mere school boys, and without the aid of a mechanic, regular and sustained correspondence would be totally impracticable.

55. To explain this, it is sufficient to state that in all our lines running N. and S. there is a natural current of electricity continuously flowing; that this current deranges the polarity of our needles, confers permanent polarity on soft iron, and produces chemical stains on prepared tissues. These facts suffice to show to those who have studied this subject, that no matter what instruments we use, whether English, American, or of our own invention, these must be constantly liable to derangement; and this irrespective of the sudden violence of the furious thunder storms occurring so frequently at particular seasons. It follows that at each station, if we use complex instruments, we must provide several of them, or at least supply them in duplicate, with a skilful mechanic to take charge of and adjust them; or else we must make instruments of such thoroughly simple forms, that our boys can do this for themselves.

56. There being no *mechanics* out of Calcutta, and here but two skilled in such handicraft, I was driven step by step to discard every screw and lever and pivot and foot of wire, and frame-work and dial, without which it was practicable to work. I accordingly tried and dismissed, successively, the English vertical astatic needle telegraph, the American dotter, and several contrivances of my own invention, most skilfully constructed by Mr. Crible of Calcutta. Every thunder-storm put the astatic needles *hors de combat*, by deranging the polarity of one or both the needles. The American temporary magnets became permanently polarized, and ceased to actuate the markers. At length, by August 1851, when incessant interruption of this kind had almost driven me to despair, I contrived the little single needle horizontal telegraph now in use in all our stations, with which we work in all weathers, without danger of interruption. It sometimes becomes disordered, as every instrument must, but it is changed or replaced or "cured" in a few seconds, by the signallers on duty, and if totally destroyed, it is but the loss of three rupees, the cost at which the

instrument is made by the boys themselves, including their profit on the construction.

EFFECTS OF LIGHTNING AT BISHTOPORE STATION ON 21ST MARCH.—57. There is on the table before me while I write one of these instruments which was in use on the evening of the 21st March, *Sunday*, at the Bishtopore station, at $\frac{1}{2}$ past 8 p. m., during a terrific north-wester. A flash of lightning struck the line, traversed the instrument, made its wires red hot, and melted their ends into beads. In less than ten minutes Charles Todd, the signaller on duty, had placed another coil in gear, and reported by telegraph to Calcutta, what had taken place in his office.

ALARM APPARATUS.—58. The same simple apparatus slightly modified, attached to a "Sam Slick" clock, causes this to ring incessantly by night, when an *alarm* is to be conveyed.

59. The *reverser*, or director by which the battery currents are transmitted, has equally undergone simplification, and improvement in point of solidity and strength, until it now totally differs from any instrument of the kind used elsewhere.

60. A *battery* of 12 to 20 pieces of platinum wire with zinc plates suffices to work our lines and instruments, through the heaviest rain and most violent storms.

61. To all our telegraphs and alarms a lightning conductor is attached, of the simplest conceivable construction, by which a flash entering the station will, in nearly all cases, pass off without injury to anything beyond the fusion of the ends of the fine wire of the instrument in use. This lightning conductor is in principle and construction totally different from those used elsewhere. I at first employed the kind known as "Walker's" on the English lines, but discarded them — too complex and expensive for use in a country where every thunderstorm would "expend" them in dozens.

TOTAL COST OF INSTRUMENTS FOR ONE STATION NOT RS. 100.—62. In fine, we can now provide all our stations with complete sets of instruments of every kind, battery reverser, telegraph and alarm, with a dozen reserve telegraphs, for less than one hundred rupees. I need say nothing to point out the importance of this fact, when we have to provide for the numerous offices which before long must be organized in this country.

TOTAL EXPENDITURE ON LINES.—63. I have next to show the total expenses incurred up to this time in the construction of the line, dis-

tinguishing this specially from the cost of experiments of the training school for pupils, office rent, furniture, instruments for meteorological observations, maps, books, clocks, erection of Bungalows for some out-stations: also setting aside the value of articles lent from the arsenal and naval stores, such as two chain cables, tents, wax pawlins, ■ brass six-pounder gun for signals, a semaphore mast, some meteorological instruments, telescopes, &c.; lastly, stores in hand ■ taken credit for at cost price. All this duly considered, the accompanying sketch account shows the cost of construction of 11 miles subterranean, and 69 miles overground line, independent of river crossings, to have amounted to Rupees 36,201-7-11, being at the rate of 452-8-3 Rupees per mile.

64. The detailed Accounts have been submitted to the Military

Board up to 31st December, 1851, and to the Accountant, to the Government of Bengal, up to 31st October, 1851, leaving only Rupees 6,777-1-2 unadjusted, of which the accounts are in prepara-

Received from the General Treasury,	51,507	1	■
" by sale of Materials, &c., ...	1,028	3	1
	<hr/>		
	52,535	4	9
Account submitted to the Military Board,	45,758	3	7
	<hr/>		
	6,777	1	2
	<hr/>		

tion, and will be sent in as soon as practicable. Meanwhile the accompanying statement may be fully depended upon, within a margin which cannot influence any question of importance.

65. It will be remembered that the above result of Rupees 452-8-3 per mile, although Rupees 297-7-9 below my estimate of Rupees 750 for any line under 100 miles, is still far above what the cost of future single lines will be. Many failures and mistakes have been made, and paid for heavily. But they have led to this point, that I am enabled confidently to undertake the construction of future overground lines at the rate of 350 Rupees per mile for ■ single, 550 Rupees for ■ double line; river crossings and erection of offices being a separate charge.

EXPENSE OF LINES TO N. W. ■ MADRAS.—66. A single line to the N. W. or Madras, would amply suffice for the transmission of Government despatches. If led through the valley of the Ganges, with offices at all the large cities, a double line would be required for the wants of the community as well ■ of Government.

67. From the experience of the Home and American systems, I am of opinion that an office or station should be provided at every 100

miles, in order to secure correspondence in all weathers.

OFFICES REQUIRED IN 1,000 MILES. The cost of each office would average 500 Rupees ■ month, rent and current expenses included, say 5,000 Rupees ■ month as the cost of correspondence on a line of 1,000 miles.

68. I believe that without clashing with the Government work, the ten stations thus contemplated would, on the N. W. trunk road line, pay a very considerable sum for the transmission of private business, provided the system be adopted of making a low and uniform charge (for each message of 16 words, of 2 syllables each, ONE RUPEE,) irrespective of the distance to which the message is sent.

A DOUBLE LINE MUST YIELD A LARGE PROFIT.—69. With a double line along the valley of the Ganges to Allahabad and *via* Agra to Bombay, at a cost of 550 Rupees per mile, and embracing 25 stations, I consider it beyond all doubt that not only would every expense be paid but a large net profit would be ensured.

70. It is not alone the great stations on the line itself, that would be benefitted; every place of importance within say 100 miles of the line at each side would be brought within a day's correspondence of all the stations, the two great termini and centre, say Calcutta, Bombay and Agra, included.

71. On the cost of construction of such great lines, and of providing these with apparatus, and on the expense of their establishment and working, there can be no uncertainty. The Diamond Harbour and Ked-goree lines have answered every question of this kind. The time required for construction has been rendered equally certain. Allowed eight months for importation and collection of materials, their distribution on the line and all other preliminary arrangements, 3 or even 5 miles a day could be *easily* constructed from the commencement of operations.

72. But to ensure the economy and despatch above described, iron rods and such materials must be procured in the English market, not at the ruinous and extortionate rates which prevail in Calcutta whenever purchases are made on Government account.

73. Having already, in my letters of the 10th and 13th February, adverted to my own position in connexion with the experiments and the construction of the lines now in operation, and referring to these letters for the discussion of many matters with which I am unwilling to encumber this Report, I have in conclusion to solicit the indulgent consideration of Government for such imperfections as they may deem to exist in the results of my experiments. I have never been

in a Telegraph Office elsewhere, and I have had no one to refer to here for advice in any doubtful case. Moreover, whatever has been done has been accomplished in the hours snatched with difficulty from the laborious duties of the Assay Office, in which I well knew that not even the semblance of the slightest remissness would be passed over, without severe animadversion, by the Mint Committee.

I have the honor to be,

SIR,

Your most obedient Servant,

W. B. O'SHAUGHNESSY,

Supdt. Electric Telegraph.

CALCUTTA,
ELECTRIC TELEGRAPH OFFICE, }
The 30th of March, 1852. }

APPENDIX.

A.

Abstract Account of Construction of the Experimental Electric Telegraph from Calcutta to Kedgeree, the Moyapore Line, and a Branch Line from Baliaghata to Tarapooka and the crossings of the Rivers "Hooghly" and "Huldee," Erection of Bungalows at Rajhat and Bishtopore. Signalling School and Experiments.

Dr.

Cr.

To Amount received from the General Treasury on account Construction of the Electric Telegraph Lines from Calcutta to Kedgeree, and the Branch Line from Baliaghata to Tarapooka as also the amount of Signaller's Establishment (down to 30th November 1851,) Observatory and Experiments,...	51,507 1 ■	By Amount of expenses incurred for the Construction of the undermentioned Electric Telegraph Lines : Underground Line from Calcutta to Rajeemulla Chuck, 11 Miles. Overground Line from Bishtopore to Moyapore, 11 " Ditto from Rajeemulla Chuck to Diamond Harbour and Kholakhali, 22 $\frac{3}{4}$ " Ditto from Buffaloe-point to Kookroohattee and from Kookroohattee to Kedgeree, 25 $\frac{1}{2}$ " Ditto Branch Line from Baliaghata to Tarapooka, 10 " (Rs. 452-8-3 per Mile.) Total, 80 Miles.	36,201 7 11
To Balance,.....	950 4 11		4,930 15 6
Memo.—The average cost per mile, exclusive of Stores lent from the Arsenal and the expenses for crossing the Rivers "Huldee" and "Hooghly," and including all other charges, stand at Rs. 594-1-2, of which Rs. 141-8-11 is not chargeable for the Construction of the Lines, being the value of articles in Store and the expenses of the Signalling School, Observatory, and Experiments and rent for a period of 18 months.			7,410 13, 5
Company's Rupees,.....	52,457 6 7	Company's Rupees,.....	52,457 6 7

Errors and Omissions Excepted,

Calcutta, Electric Telegraph Office, {
The 30th March 1852. }

W. B. O'SHAUGHNESSY, Superintendent, Electric Telegraph.

B.*Abstract of Establishment of the Electric Telegraph.*

<i>Inspector.</i> —1st Class. Baboo Seeb Chunder Nundy, ..	100 0 0
Travelling Allowance,	40 0 0
	140 0 0

Calcutta, Bishtopore, Moyapore, and Diamond Harbour.

<i>Reader.</i> —2nd Class. Mr. B. C. Bailey,	75 0 0
" " H. D. Shuldham,	55 0 0
" " C. Todd,	55 0 0
3rd Class. " J. E. Cearns,	27 8 0
" " W. Minton,	27 8 0
" " J. Todd,	27 8 0
" " A. G. D'Labat,	27 8 0
" " J. Wachsel	30 0 0
4th Class. " A. Todd,	16 0 0
" " J. Gadding,	16 0 0
" " Shreenauth Newgee,	16 0 0
" " W. J. Shuldham,	16 0 0
" " T. Reynolds,	16 0 0
" " C. J. A. Wickings,	16 0 0
	421 0 0
<i>Printer.</i> —Mr. D. Jaramino,	27 8 0
<i>Pressman.</i> —Bacho,	7 0 0
<i>Duftry.</i> —Surrya Toollah,	5 0 0
	39 8 0

Chowkedars for watching the Electric Telegraph Lines.

<i>Jemadar.</i> —Wolfinally,	12 0 0
<i>Chowhedar.</i> —Setul Misser,	6 0 0
" Sudderally,	6 0 0
" Rajmohun Sing,	6 0 0
" Bodhoo,	4 0 0
" Mahmodally,	4 0 0
	38 0 0

<i>Battery Men.</i> —Laloo,	6 0 0
Morad,	5 0 0

<i>Lascar.</i> —Hyder,	6 0 0
	17 0 0

<i>Durwan.</i> —Dabee Sing,	6 0 0
	6 0 0

<i>Peons' Jemadar.</i> —Lollmahmod	7 0 0
<i>Peons.</i> —Hyder,	5 0 0
Golup,	5 0 0
Naw Cowrie,	5 0 0
Rackeebuddin,	5 0 0
Nusseruddin,	5 0 0
Ramchurn,	4 0 0
	36 0 0

<i>Punkah puller.</i> —Shreemunto	5 0 0
<i>Furwas.</i> —Bussunth,	5 0 0

<i>Rhistee.</i> —Buxoo,	2 0 0
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<i>Metar.</i> —Domun,	5 0 0
	17 0 0

<i>Sweeper.</i> —Jhateram,	1 8 0
	1 8 0

Kookroohattee to Kedgeree.

<i>Reader.</i> —3rd Class. Mr. W. G. Duell,	—	30	0	0		
"	"	F. Christian,	...	30	0	0		
"	"	C. Wiseham,	—	30	0	0		
"	"	J. H. Lethbridge,	...	30	0	0		
				—	—	120	0	0
<i>Battery man.</i> —Musseruddy,	—	6	0	0		
<i>" Huldee," Guard Boat.</i> —1 Munjee and 4 Lascars, ..				25	0	0		
				—	—	25	0	0
						867	0	0
Company's Rupees,.....								

Errors Excepted.

*Calcutta, Electric Telegraph }
Office, the 30th of March 1852. }*

W. B. O'SHAUGHNESSY,
Supdt. Electric Telegraph.

MEMO:—Exclusive of the above, ■ Guard boat will be entertained for the Hooghly River at Co.'s Rs. 100 per mensem.

C.

Extract from Dr. O'Shaughnessy's Report No. 4, addressed to the Government of India on the completion of the Experimental Line of Electric Telegraph between Alipore and Diamond Harbour, Dated 10th March, 1851.

Para. 4. The insulation, mechanical protection, and burying of the conductor was carried on steadily from the 5th of November 1850 at the rate of 1,300 feet per working day. Each day's work was tested by suitable instruments every hour. The first section of the line from Alipore to Rajhat, distance 15 miles, was thus completed on the 7th of February 1851.

5. For these 15 miles the line consists of an Iron rod three-eighths inch in diameter, weighing 1,939 average pounds per mile, made up from separate lengths of 13 feet 6 inches each, all welded together, end to end. The rod is next coated hot with two layers of Madras cloth, saturated with melted pitch, softened with a due admixture of Tar so as to form a flexible coating when cool. These two coatings spirally applied and overlapping each other in opposite directions give practically four layers of a pliable defensive envelope utterly impervious to water and saline matters, and not liable to decay or to the attacks of insects, white-ants, or vermin of any kind.

6. The coating of the line in this manner was carried on under the inspection of Serjeant Smith, by a Tindal and 20 Lascars, at the rate of 2,000 running feet for each working day.

7. But to protect the rod still further, chiefly from mechanical injury, it was finally laid in a row of roofing tiles half filled with a melted mixture of three parts dry sand and one part rosin (by weight), and when laid the whole was filled up with the same melted mixture. When cold the mass becomes as solid as stone and was immediately covered in with wet clay well beaten down, the trench filled in, and the clay again beaten with heavy rammers so as to form a dense mass free from fissures and holes, and equal in density to the old portions of the road.

8. This work was tedious, 1300 to 1700 feet daily, being done by 50 workmen on high wages, under the superintendence of an European, Serjeant Anderson, with two Native Inspectors.

9. The trench to receive this line was cut 2 feet deep by 2 feet wide along the edge of the metalled road.

*Rules for the Management of the Electric Telegraph, between Calcutta,
Diamond Harbour and Kedgeree, passed on the 18th of December 1851.*

1st.—Until further orders, the service shall be conducted by the Superintendent, in direct communication with the Government of Bengal.

2nd.—The Telegraph Station shall be open continuously, day and night, throughout the year, for the receipt and transmission of correspondence.

3rd.—The Officers, named on the margin, are authorized to have their messages on public service conveyed, subject to *pro forma* charge at the usual rates, taking precedence of all private communications. Other public Officers, having messages on public service to transmit, will apply to the Superintendent; or in emergent cases to one or other of the Officers above named.

Secretaries and Under Secretaries to Government.
Superintendent of Marine and his Secretary.
Master Attendant and his Assistants.
Collector of Customs, Deputy Collector and Assistant.

4th.—All ordinary shipping intelligence is to be transmitted, in writing, hourly to the Superintendent of Marine and the Master Attendant. Important shipping intelligence is to be transmitted, immediately upon receipt, to the same Authorities.

5th.—Printed Reports of intelligence are to be issued at 10 A. M., 1 P. M. and 4 P. M. These will be forwarded to the offices of the Authorities named on the margin, and to all Firms and individuals who are Subscribers. Arrivals after 4 P. M., are to be notified specially in writing, to the Agents of the Vessels, if Subscribers, without extra charge, and to be posted outside the office in a conspicuous place.

Members of Government, Secretaries to Government, Private Secretaries to the Governor General and Deputy Governor of Bengal.

† Superintendent of Marine.

† Master Attendant.

† Register of Seamen.

Board of Revenue.

† Collector of Customs.

† Superintendent of Preventive Officers.

Military Board.

† Post Master General.

The Authorities marked thus (†) will be charged, *pro forma*, as registered Subscribers.

Officers not named in the above list, requiring, on public service,

6th.—Special notice of the arrival of any specified Vessel is to be sent immediately to the residence or office of any person within Calcutta, requiring it, at a charge of four annas in the case of a Subscriber, and one rupee in the case of any other person.

particular information on occasions, should intimate to the Superintendent the information they require, which will be specially furnished to them, subject to *pro forma* charge at the usual rate.

8th.—Any Officer, Signaller, Clerk or other person employed in the Telegraph Stations, disclosing improperly the particulars or tenor of any message sent by Telegraph, whether on public or private service, shall be dismissed, forfeiting all arrears of salary; and shall be declared disqualified from serving Government in any capacity.

9th.—Messages will be transmitted at the following rates:

To any Station on the Diamond Harbour line, at four annas for each word of not more than two syllables, and one anna for each additional syllable.

To any Station beyond the Hooghly, on the Kedgeree line, eight annas for each word of not more than two syllables, and two annas for each additional syllable.

Messages will be delivered on board of Vessels at the River Stations, at a charge of eight annas for boat hire; and messages will be delivered to persons in Calcutta, without charge for peon hire to Subscribers, and at a charge for peon hire of four annas to other persons. Messages will be delivered, at moderate distances beyond Calcutta, to all persons, at the necessary extra charge for Karanchy hire, in addition to four annas for peon hire.

10th.—Between sunset and sunrise the above charges will be doubled, and the Superintendent will be allowed, at his discretion, to divide the receipts on account of such night messages amongst the Signallers who receive and transmit the communication.

11th.—The transmission of messages gratuitously is prohibited on penalty of dismissal.

1. Vessels in distress.
2. Mail Steamers.
3. Public Service.
4. Private Service of Subscribers.
5. Shipping business.
6. Private Service of Individuals and Firms, not Subscribers.

12th.—Messages will have precedence in the order noted in the margin.

13th.—Persons using the Telegraph are admitted into the outer room of the office; but no persons, whether public Officers or private individuals, will be admitted into the inner rooms.

Visitors can be allowed access to the Signal room only by the special order of the Superintendent.

14th.—No record or copy is to be kept of the nature or contents of any despatch on private business, but an entry will be made in the Station Journal in the form shown in the margin.

Message received from
Messrs. A. B., for trans-
mission to Diamond
Harbour, (or other Sta-
tion.)

— Words of
not more than
two Syllables at
4 annas, 0 0 0

— Additional
al Syllables, ... 0 0 0
Boat hire, 0 0 0

Reply — Words
of not more
than two Syl-
lables, at 4
annas, 0 0 0

— Additional
al Syllables, ... 0 0 0
Peon hire, 0 0 0

Total charge,
(Date and Name of
Signaller.)

amount in any month to more than one-fourth of the salary or wages of the persons punished, the case shall be especially reported for the orders of Government.

ESTABLISHMENT.

The Establishment, pending further orders, shall consist of a Superintendent, Assistants and Workmen.

The Assistants are of 4 Classes.

FIRST CLASS INSPECTORS.

QUALIFICATIONS.—A good English Education.

A correct knowledge of Orthography.

A perfect knowledge of the principles, construction, working, adjustment, protection and repairs of the lines of conductors, and of all the instruments employed.

Quickness and correctness in despatching and receiving Signals.

Knowledge of Marryatt's and Bedford's Marine and River Codes.

Good character for sobriety, diligence and activity, and good habitual health.

Salary 100 rupees a month, with 40 rupees for travelling expenses when employed out of Calcutta.

SECOND CLASS READERS.

QUALIFICATIONS.—A good English Education; correctness in Orthography; rapidity and precision in transmitting and reading Signals by spelling, and with needle Telegraphs.

Knowledge of the adjustment of instruments, and of Marryatt's and Bedford's Codes.

Salary 55 Rupees to 75 Rupees a month.

THIRD CLASS—SIGNALLERS.

Apprentices.

QUALIFICATIONS.—A good English Education; correctness in transmitting Signals, and proficiency in reading Signals. Salary 27-8-0 a month.

FOURTH CLASS—PROBATIONERS.

QUALIFICATIONS.—A good English Education. A Guarantee from a guardian, or parent, of readiness to enter into apprenticeship according to Act XIX. of 1850.

Probationers receive no pay, but are permitted to learn the practice of signalling at such Stations as may be convenient, for a period of 3 months, when they will be subjected to examination, and discharged if not found qualified for admission on the Apprentice List. If employed at out-stations, or on temporary duty, they will receive pay at the rate of 16 rupees per month.

By order of the Hon'ble the Deputy Governor of Bengal,

J. P. GRANT,

Secretary to the Government of Bengal.

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